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VALIDATION OF A DENSITY SEPARATION TECHNIQUE FOR THE RECOVERY OF MICROPLASTIC AND ITS USE ON MARINE & FRESHWATER SEDIMENTS.

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Density Separation Validation

- Claessens et al., (2013) protocol (3:1)
- Brine solutions (4) & water
- Sediment (200-400 µm)
- MP size classes (200-600 µm)
- Different plastic types
- N=9, individually & mixture

Densities of Saturated Brines Solutions	
Solution	Density (g/cm^{-3})
water	1.0032
NaCl	1.1708
NaBr	1.37
NaI	1.566
ZnBr2 (25%)	1.71
ZnBr2	4.2

Plastics in validation test		
Plastic	**Source**	**Density (g/cm-3)**
High density Polyethelene (HDPE)	Air waves base	0.941 g/cm^3.
High density Polyethelene (HDPE)	Milk carton	0.941 g/cm^3.
Low density Polyethelene (LDPE)	Air waves lid	0.915–0.925 g/cm^3
Nylon	Thread	1.13-1.15g/cm3
Polyethelene (PE)	Supermarket bag	0.926–0.940 g/cm^3.
Polyethelene terephthalate (PET)	Lucozade bottle	1.38 g/cm^3
Polypropylene (PP)	Plastic container	0.855 -0.946g/cm3
Polystyrene (PS)	Coffee lid	0.946 g/cm3
Polystyrene (PS)	Plastic forks	0.946 g/cm3
Polyvinyl chloride (PVC) Un Plasticised	Window frame	1.35-1.45 g/cm3.
Polyvinyl chloride (PVC) Plasticised	Wire	1.35-1.45 g/cm3.
polyethylene (180µm)	sigma bottle	0.926–0.940 g/cm^3.

(Claessens et al., 2013. Mar. Pollut. Bull. 70(2): 227-233)

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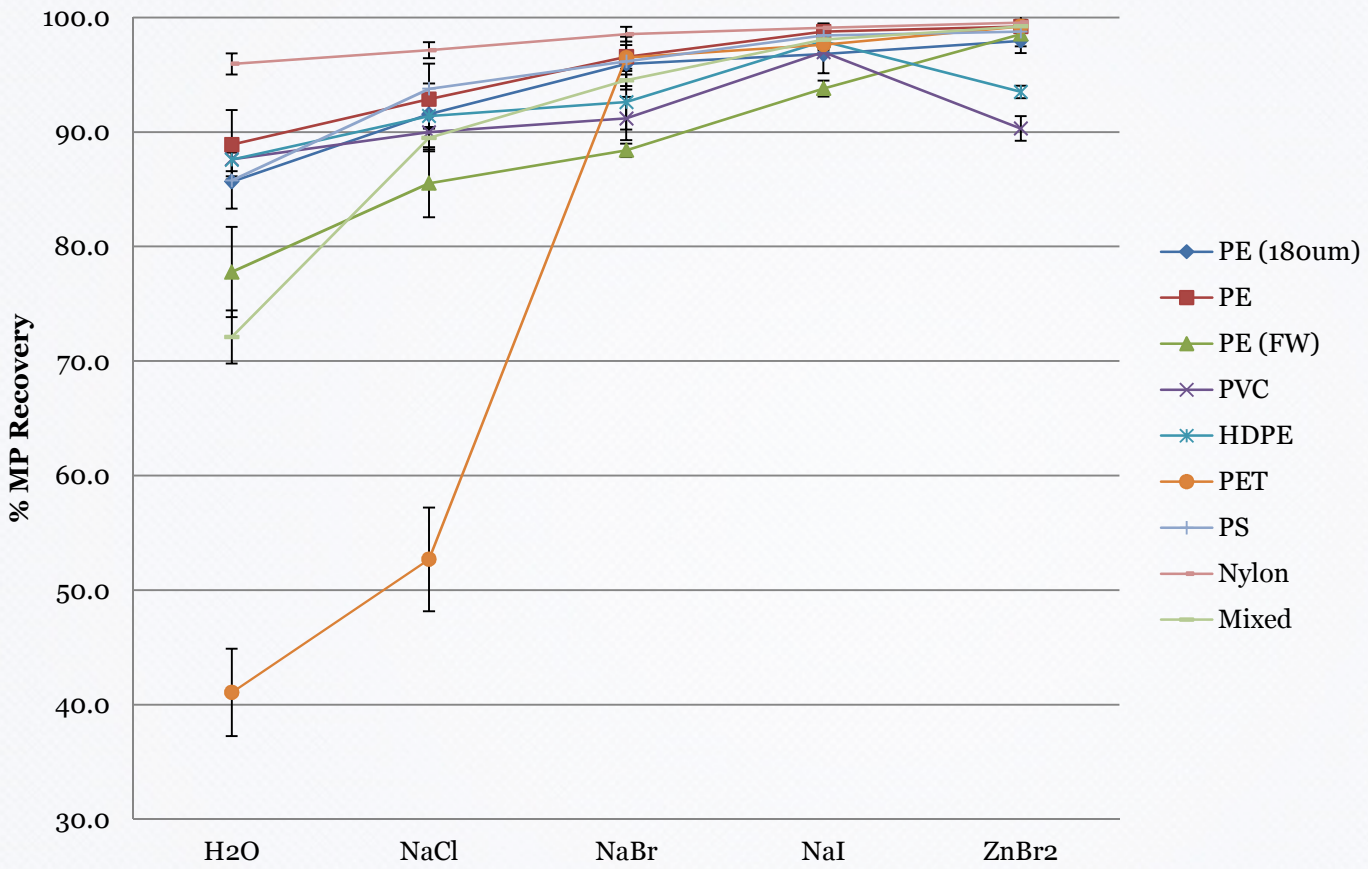
Validation results (n=9)



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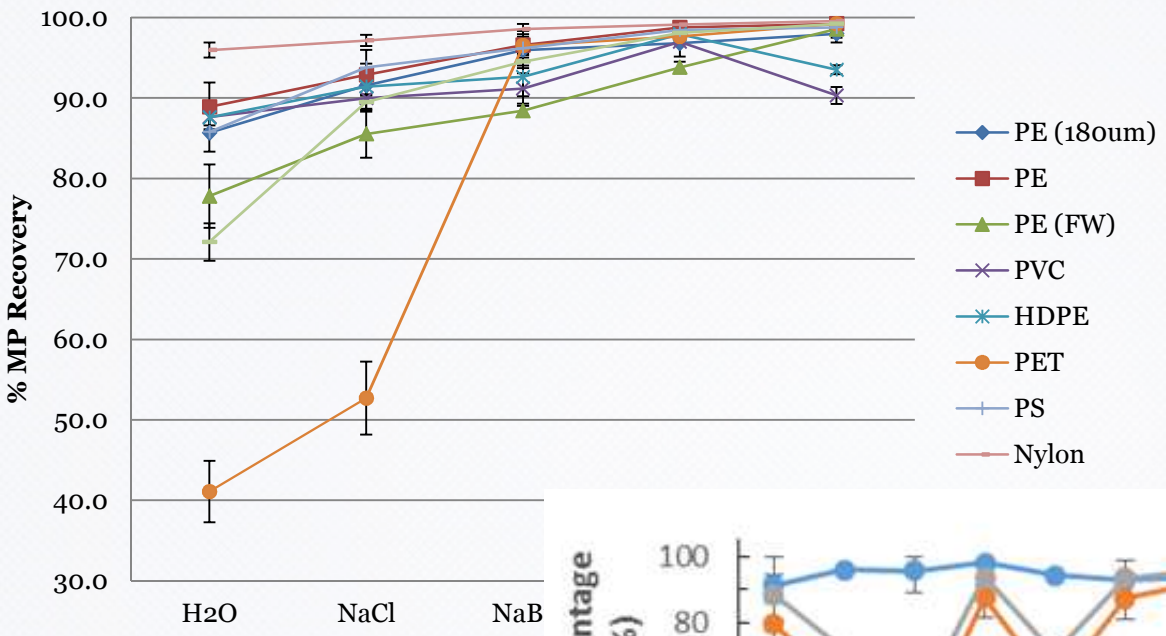
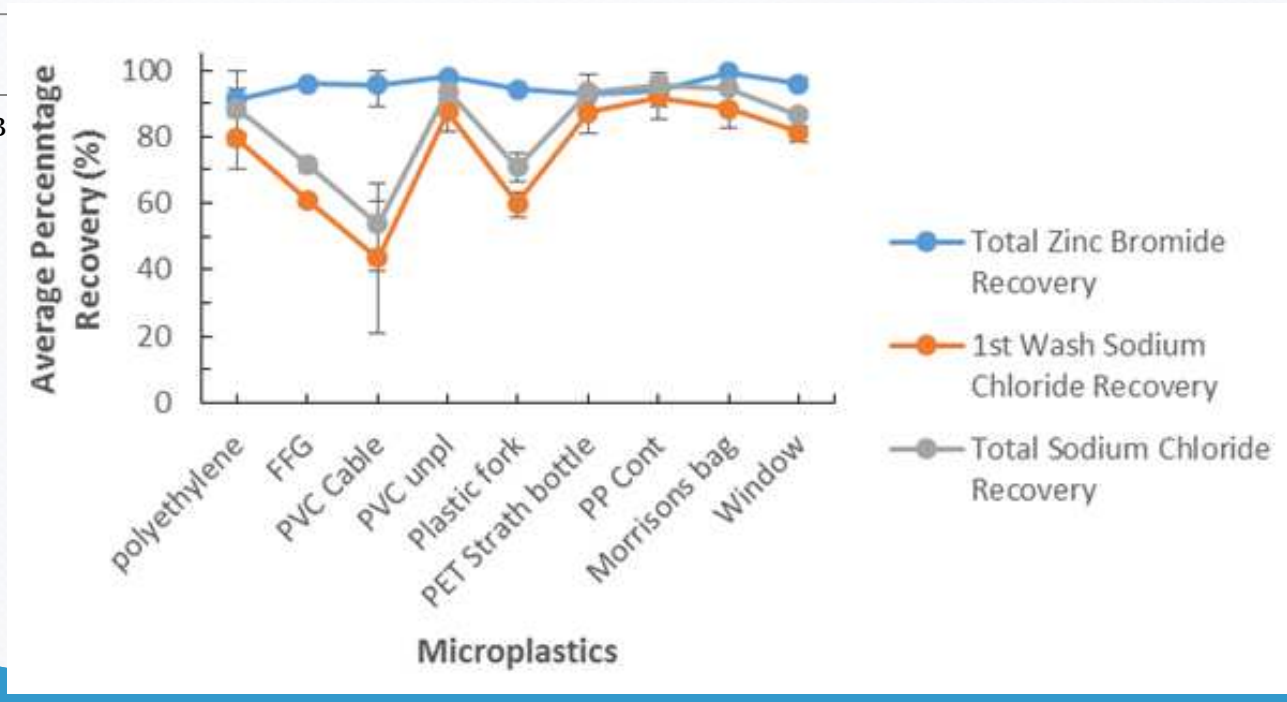
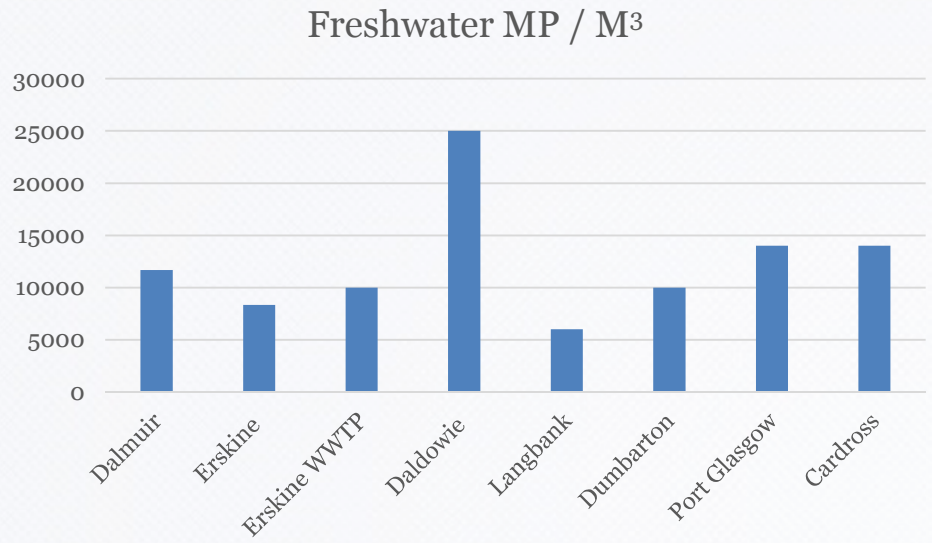
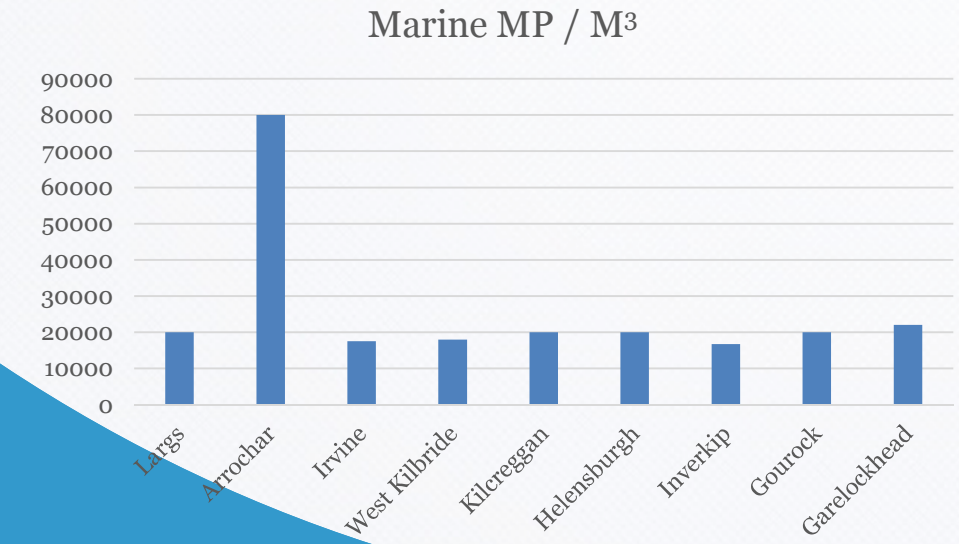
Results: Validation Experiment





Results: Environmental Samples





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Conclusion

- There are more efficient density solutions out there… $ZnBr_2$ is one of them.
- ⇧ MP extraction efficiency, ⇩ time
- Expensive to buy, but overall (including labour) cheaper

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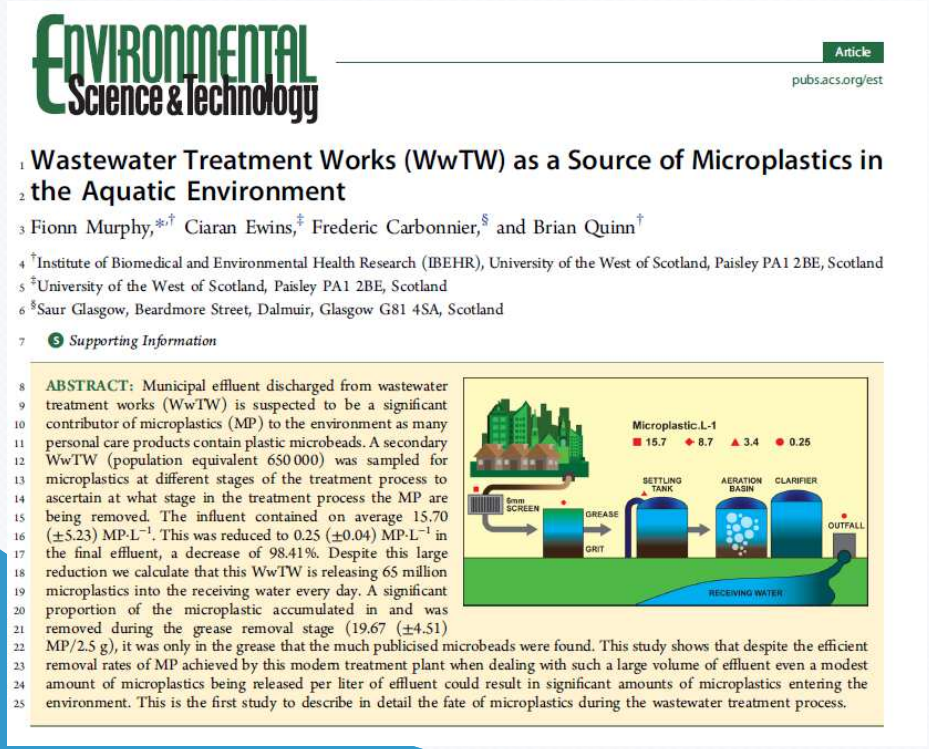
Other work…

- Scottish Microplastic Research Group - http://www.masts.ac.uk/research/masts-community-projects/scottish-microplastic-research-group/
- Fionn Murphy – Xlf (Thursday)
- Christopher Crawford – 1a



Environmental Science & Technology

Article

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Wastewater Treatment Works (WwTW) as a Source of Microplastics in the Aquatic Environment

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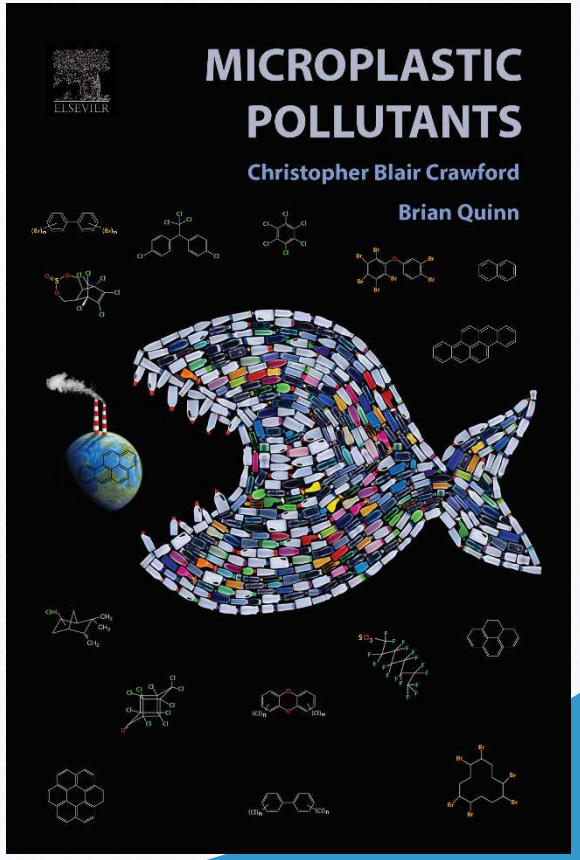
Supporting Information

ABSTRACT: Municipal effluent discharged from wastewater treatment works (WwTW) is suspected to be a significant contributor of microplastics (MP) to the environment as many personal care products contain plastic microbeads. A secondary WwTW (population equivalent 650 000) was sampled for microplastics at different stages of the treatment process to ascertain at what stage in the treatment process the MP are being removed. The influent contained on average 15.70 (±5.23) MP·L^{-1}. This was reduced to 0.25 (±0.04) MP·L^{-1} in the final effluent, a decrease of 98.41%. Despite this large reduction we calculate that this WwTW is releasing 65 million microplastics into the receiving water every day. A significant proportion of the microplastic accumulated in and was removed during the grease removal stage (19.67 (±4.51) MP/2.5 g), it was only in the grease that the much publicised microbeads were found. This study shows that despite the efficient removal rates of MP achieved by this modern treatment plant when dealing with such a large volume of effluent even a modest amount of microplastics being released per liter of effluent could result in significant amounts of microplastics entering the environment. This is the first study to describe in detail the fate of microplastics during the wastewater treatment process.



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